

A NEW CRAWFISH OF THE GENUS *ORCONNECTES* FROM
THE YAZOO RIVER SYSTEM OF MISSISSIPPI
(DECAPODA: CAMBARIDAE)

J. F. Fitzpatrick, Jr. and Royal D. Suttkus

Abstract. — The crawfish *Orconectes* (*Hespericambarus*) *hartfieldi*, is described from five sites in the Yazoo River system of Mississippi. It is distinguished by a notch near the apex of the central projection of the first pleopod of the first form male, and the annulus ventralis of the female is the most sculptured in the subgenus. Its closest relatives seem to be *O. (H.) hathawayi* Penn and *O. (H.) perfectus* Walls; geographically, it is distributed between the ranges of the two.

Most of the populations of members of the crawfish genus *Orconectes* that occur in the Big Black, Tombigbee, and Yazoo systems of Mississippi currently are not assigned trivial names. Most of them, nevertheless, can be relegated to the subgenus *Gremicambarus* (Fitzpatrick, 1987), but otherwise they are so similar in morphology that it is difficult to separate one interbreeding group from another. This was recognized by Cooper & Hobbs (1980:1) when they observed: "Unfortunately, without first form males, we have been unable to identify specimens in the genus from many localities in the Mobile and Tennessee basins." They emphasized the need for knowledge of the precise limits of variation in the non-secondary sexual characters. Otherwise, only the morphology of the first pleopod of Form I males is reliable for the identification of species. We can add that even the character states of non-sexual features, without good series for comparison, can be misleading. We can likewise include the Big Black and Yazoo basins in systems inhabited by such populations.

When Walls (1972) described *Orconectes* (*Hespericambarus*) *perfectus*, he implied that similar situations exist in this subgenus. Although morphologically similar populations occur throughout the Tombigbee ba-

sin and many were at his disposal, he expressly limited his paratypic series to a few populations in the immediate vicinity of the type locality. Recently, one of us (RDS) collected first form males and other specimens assignable to this subgenus from four widely spaced localities in the Yazoo basin. The first pleopod of the Form I male and the annulus ventralis of the female are sufficiently distinctive that we are secure in our belief that these populations represent a previously undescribed species. Further, the geographic dispersal, enhanced by another single Form I male collected in 1967 from yet another distant locality, precludes the possibility that the specimens are local or abnormal variants.

Orconectes (*Hespericambarus*) *hartfieldi*,
new species
Fig. 1

Diagnosis. — Pigmented; eyes normal. Rostrum with slightly thickened, somewhat converging margins ending cephalically in small acute spines; lacking median carina; acumen distinct, moderately long, and clearly delimited basally from remainder of rostrum. Areola obliterated for most of length and comprising 31.9 to 35.2% (avg. 33.3%) of total carapace length, and 44.1 to 47.6% (avg. 45.7%) of postorbital carapace

length. Cervical spine prominent; suborbital angle absent; postorbital ridge well developed and terminating cephalically in strong acute spine. Antennal scale usually 2.06 times longer than wide and widest slightly distal to midlength. Chelae of adult males inflated, slightly costate laterally at best, and covered by numerous setae occurring in loose tufts originating in shallow punctations; mesial margin with 3 to 7 small to moderate-sized acute spines or spiniform tubercles; tubercles extending onto basal half of mesial margin of dactyl in varying degrees of development and number, often with squamous or low spiniform tubercles flanking mesial row of spines above and below; opposable margins of both fingers with small tubercles in basal half and slightly irregular band of minute denticles in distal half; both fingers with weakly developed longitudinal ridges flanked by scant setose punctations above and below. Hook on ischium of third pereopod only, not opposed by tubercle on corresponding basis; coxae of pereopods lacking boss. First pleopod of first form male reaching coxae of third pereopod when abdomen flexed, lacking shoulder on cephalic surface, terminating in two elements, both inclined caudodistally; central projection longer and with slight subapical notch or shallow depression caudodistally; mesial process non-corneous, only slightly curved, tapering smoothly to subacute apex and directed caudomesially at about 45° angle to main shaft of appendage. Annulus ventralis of female as figured. First pleopod present in female.

Holotypic male, Form I. — Body and eyes pigmented. Cephalothorax (Figs. 1b, l) subovate in section, abdomen narrower than carapace (10.1 and 11.2 mm), width of latter greater than depth at caudodorsal margin of cervical groove (11.2 and 10.5 mm). Areola obliterated for most of length with usual subtriangular cephalic part and weakly developed divergent margins in caudal fifth of thoracic portion of carapace; length 33.3% of total length of carapace (45.9% of post-

orbital length). Rostrum with margins little thickened, elevated, slightly convergent, and bearing small but acute spines at base of clearly delineated acumen, latter almost reaching distal end of antennular peduncle; upper surface slightly concave, lacking median carina, and only sparsely punctate except for row flanking elevated margins mesially. Subrostral ridge weak, disappearing in dorsal aspect before reaching base of rostrum. Postorbital ridge heavy, with dorso-lateral and dorsomesial grooves, terminating cephalically in strong acute spine. Suborbital angle absent. Cervical spine single, strong, and acute; branchiostegal spine well developed. Carapace studded with shallow setose punctations developing into granulose tubercles ventrolaterally. Abdomen shorter than carapace (22.8 and 23.7 mm); pleura well developed and rounded ventrally except that of second abdominal segment, which subtruncate; cephalic section of telson with 2 spines in each caudolateral corner, more mesial ones movable. Proximal podomere of uropod with acute spine on mesial lobe only; mesial ramus with distinct but weakly developed dorsomedian keel terminating in small premarginal spine; lateral ramus likewise keeled.

Cephalic lobe of epistome (Fig. 1n) lacking cephalomedian projection and delimited basally by distinctly contracted base; margins elevated with distinct notch (?old injury) on left side; cephalic lobe excavate with prominent longitudinal median ridge rising (ventrally) as high as margins; main body with deep, pit-like fovea; epistomal zygoma broadly arched. Basal segment of antennule with small spine on ventral surface slightly distal to midlength. Antennae almost reaching caudal margin of fifth abdominal segment. Antennal scale (Fig. 1k) 2.24 times as long as broad with greatest width slightly distal to midlength; mesial border of lamella rounded but less than evenly so; apical spine strong and reaching just beyond distal margin of ultimate podomere of antennal peduncle.

Right chela (Fig. 1m) depressed, weakly costate laterally only along basal half of immovable finger, 2.1 times longer than broad; all surfaces pubescent. Mesial margin of palm with row of 4 spiniform tubercles, somewhat obscured by pubescence and 1 rounded tubercle proximally; 2 small tubercles on mesial margin of dactyl near base obscured by pubescence. Fingers not gaping. Opposable margin of fixed finger with row of 6 tubercles in basal half and band of crowded minute denticles extending distally from penultimate tubercle of group, denticles interrupted half way to tip of finger by another small tubercle; additional tubercles ventral to aforementioned dentition at base of finger and at base of distal fourth of finger; all tubercles and denticles obscured by pubescence. Opposable margin of dactyl with 4 subequal tubercles in basal half and band of crowded minute denticles extending to apex of finger, large tubercle ventral to row at base of finger; all tubercles and denticles obscured by pubescence. Carpus about 1.2 times longer than broad, with arched groove dorsally, later flanked mesially by few low tubercles and laterally by scarce, very shallow punctations; mesial surface with spike-like tubercle distal to midlength and broadly triangular one subdistally; ventral surface with spiniform tubercle in mesiodistal and laterodistal corners. Dorsal surface of merus with 2 stout spines distally; lateral and mesial surfaces with scarce, shallow punctations; lower lateral margin with row of 8 small tubercles terminating distally in prominent spiniform one; lower lateral margin with evenly spaced row of 3 spiniform tubercles in distal half. Basis, ischium, and coxa with margins entire. Ischium of only third pereopod with simple strong hook (Fig. 1j), latter overreaching distal margin of corresponding basis but unopposed by tubercle.

First pleopods symmetrical, reaching coxae of third pereopods when abdomen flexed. First pleopods (Fig. 1a, c, g-i) as described in "Diagnosis"; subterminal exca-

vation of central projection shallow, not distinct notch.

Allotypic female.—Differing from holotype, except in secondary sexual characteristics, in following respects: abdomen longer than carapace (31.0 and 28.1 mm) and only slightly narrower than carapace (12.8 and 13.0 mm). Mesial margin of palm with 5 spinose tubercles; distalmost tubercles of mesial margin of carpus much more spine-like and acute than others; lower lateral margin of merus with 4 tubercles and distally one low spiniform tubercle followed by ultimate strong spiniform tubercle.

Annulus ventralis (Fig. 1e) as illustrated; sinus originating lateral to midline in deep posteromesially inclined sulcus in cephalic third of annulus, continuing across midline before turning caudally to anterior border of caudal third of annulus, there turning sharply to midline and thence recurving to follow gently sinuous path to caudal margin. Postannular sclerite about half as wide as annulus and just over three times as broad as long. First pleopods small but distinct.

Morphotypic male, Form II.—Differing from holotype in following respects: mesial margin of palm with row of 3 low tubercles; mesial margin of carpus more like allotype than holotype; conspicuous gap between ultimate and penultimate spiniform tubercles of lower mesial margin of merus, lower lateral margin with row of 7 low tubercles proximally and distalmost two spiniform similar to those of allotype. Hook on ischium of third pereopod weakly developed, not overreaching distal margin of corresponding basis. Cephalic lobe of epistome weakly excavate, lacking median longitudinal ridge; fovea of main body corresponding more shallow.

Color.—Color notes are available for the Panola County specimen. Base color olive tan diffused with darker brown and blue-black pigments. Rostral margins light; large irregular tan spot just posterior to caudal extremity of postorbital ridge. Density of dark pigment increasing dorsally so that

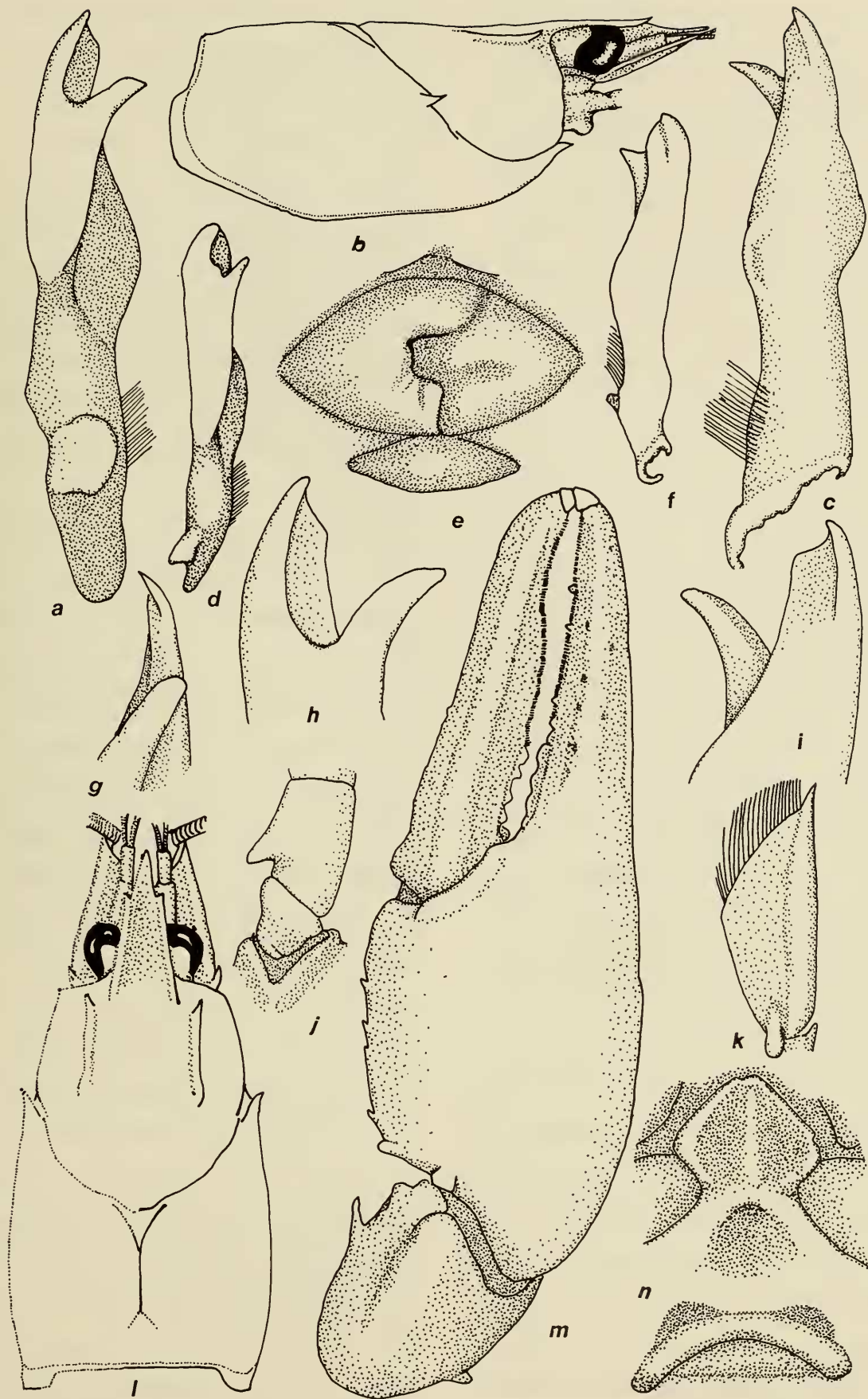


Fig. 1. *Orconectes (Hespericambarus) hartfieldi*, new species (all from holotype, except d and f of morphotype and e of allotype): a, d, Mesial view of first pleopod; b, Lateral view of carapace; c, f, Lateral view of first pleopod; e, Annulus ventralis; g, Caudal view of apex of first pleopod; h, Mesial view of apex of first pleopod; i, Lateral view of apex of first pleopod; j, Coxa and ischium of third pereiopod; k, Antennal scale; l, Dorsal view of carapace; m, Dorsal view of distal podomeres of right first cheliped; n, Epistome.

ventral half of carapace to about level of cervical spine pale tan, but dorsal half dark brown mottled with small light tan spots. Caudodorsal part of thoracic region posterior to cervical spines lighter with transverse rows of fine dark spots giving appearance of 4 stripes. Cephalic triangular area of areola nearly filled with blue-black subtriangular spot; irregularly shaped blue-black spot just above cervical spine and anterior to cervical groove; several large blue-black spots at dorsal caudolateral margin of carapace coalescing into large irregular patch just lateral to posterior flare of areola. Two undulant stripes running longitudinally along lateral faces of abdomen such that each segment provided with 2 chevrons, lower at junction of pleuron and tergum darker and thinner; pleurons and area between chevrons with numerous dark spots of varying size but always small; middorsal part of terminal segment similarly spotted but spots more dense and more regular in size and shape. Telson with thin blue-black line along lateral margin of cephalic portion, stripe expanding to encompass entire area of caudolateral spines; caudal portion of telson and both uropods with moderately large blue-black spots covering dorsal surface, more densely distributed laterally.

Palm and both fingers of cheliped beige, studded with large blue-black spots above that form row between spines of mesial margin of palm; carpus likewise spotted, as also lateral and mesial margins of merus; basis, ischium, and coxa concolorous tan. Remaining pereopods striped with alternating circular bands of beige-brown and blue-black, latter formed by coalescing dots of pigment; pattern extending from distal coxa to apex of dactyl. Basal podomeres of antennule and antenna beige with irregular blue-black stripe on lateral margins; flagella studded with fine dark spots. No records of ventral coloration available.

Type locality. — Turkey Creek, about 6 mi (9.7 km) northeast of Coffeeville, 0.2 mi (0.3 km) east of State Route 32; T25N, R7E,

section 18, Yalobusha County, Mississippi. At this locality, on 23 September 1989, the creek was approximately seven to ten meters wide; generally shallow, ranging from a few centimeters to half a meter in depth; however, in a few places reaching over a meter in depth. The current was slow to moderate and much of the sand bottom was silt-covered. There were numerous snags with varying amounts of detritus caught around their bases. The water was clear upon arrival at the site but soon became turbid from clouds of silt that went into suspension because of collecting activities. The water was 18°C at 1540 hr when the collection was made.

Disposition of types. — The holotype, allotype, and morphotype (USNM 220651, 220652, and 220653, respectively) are deposited in the National Museum of Natural History, Smithsonian Institution, as is a single paratypic male, Form I. The remaining paratypes (3 ♂I, 4 ♀) are in the Tulane University Museum of Natural History (TU).

Range and specimens examined. — The species is known from only five localities, all in the Yazoo River basin in Mississippi: Calhoun County: (1) Cowpen Creek at St. Rte. 9, 8.6 mi (13.8 km) NNE of Bruce, T11S, R1W, sec. 29, 1 ♂I, 1 ♀, coll. 26 Aug 1989, R.D.S. (TU 6431); Carroll County: (2) Abiaca Creek at St. Rte 17, 0.3 mi (0.5 km) S of Black Hawk (St. Rte. 430), T17N, R3E, sec. 20, 1 ♂I, coll. 27 Sep 1987, R.D.S. (TU 6433); Panola County: (3) Oil Creek, 1.5 mi (2.4 km) E of U.S. Hwy. I-55 on St. Rte 315, T7S, R6W, sec. 30, 1 ♂I, coll. 10 Aug 1967, J. F. Payne, W. G. Anding (USNM 220654); Tallahatchie County: (4) Bellamy Creek, 1.3 mi (2.1 km) S of St. Rte. 32 in Charleston, T25N, R2E, sec. 26, 1 ♀, coll. 27 Oct 1989, R.D.S. (TU 6432); Yalobusha County: (5) type locality, 1 ♂I (holotype), 1 ♂II, (morphotype), 1 ♀ (allotype); 1 ♂I, 2 ♀ (TU 6438), coll. 23 Sep 1989, R.D.S.

Variations. — With so small a type series, observed variation is slight; most is encompassed within the limits expressed in the

descriptions of the types, above. The specimens from the type locality seem small by comparison with the other available samples. The carapace lengths of the types are 23.7, 28.1 and 18.5 mm (Table 1), and of the topotypic male, Form I, 21.5 mm, those of the females, 22.2 and 19.5 mm. The carapace length of the Panola County male, Form I is 33.2 mm; while those of the Calhoun County specimens are: male, Form I, 35.8; female, 32.8 mm. The greatest variation noted is in the spinose ornamentation of the cheliped. As noted in the diagnosis, the number of spiniform tubercles along the mesial margin of the palm varies from three to seven; in the morphotype, possibly a juvenile, they are reduced to small rounded tubercles. Although the pattern of distribution of the tubercular ornamentation of the lower mesial margin of the merus varies slightly, the number is consistently three (except the Panola Co. specimen has what appears to be only the broken stump of a proximal third spine on the right side); in contrast, the proximal row of tubercles of the lower lateral margin varies from four to eight. In one male, Form I, and the smallest female from the type locality the cephalic lobe of the epistome is nearly planar and lacks the median ridge; the epistome of the female from Cowpen Creek is similarly developed, but the fovea in the main body is deep, similar to that of the holotype. Also the smallest topotypic female has a bifid spike-like tubercle near midlength of the carpus, and the distal one is acutely spiniform.

Environmental notes.—Detailed environmental data are available also for Cowpen Creek (site 1, above) and they differ from those at the type locality. It seems worthwhile to note this range of tolerance for this species.

Cowpen Creek at St. Rte. 9 courses through a narrow, deep, precipitous ravine, and on 26 August 1989, was in low water stage. The stream bed was estimated to be 12.1–15.3 m wide with a channel of water

Table 1.—Measurements (mm) of *Orconectes (Hespericambarus) hartfieldi*, new species.

| | Holo-type | Allo-type | Morpho-type |
|----------------------------|-----------|-----------|-------------|
| Carapace | | | |
| Entire length | 23.7 | 28.1 | 18.5 |
| Postorbital length | 17.2 | 20.6 | 13.3 |
| Width | 11.2 | 13.0 | 8.8 |
| Height | 10.5 | 12.7 | 7.4 |
| Areola | | | |
| Length | 7.9 | 9.2 | 6.1 |
| Rostrum | | | |
| Length | 7.9 | 11.0 | 8.1 |
| Width | 4.8 | 5.5 | 4.1 |
| Antennal scale | | | |
| Length | 6.5 | 7.1 | 5.6 |
| Width | 3.4 | 3.8 | 2.8 |
| Right chela | | | |
| Length, lateral margin | 18.1 | 18.0 | 10.1 |
| Length, palm mesial margin | 6.4 | 5.6 | 4.6 |
| Palm width | 8.5 | 7.5 | 4.4 |
| Dactyl length | 11.2 | 12.1 | 6.9 |
| Abdomen | | | |
| Length | 22.8 | 31.0 | 18.0 |
| Width | 10.1 | 12.8 | 7.5 |

varying from 2.4 to 9.2 m in width. The entire stream bed was compacted clay as was the lower third of the stream bank. There were two ledges in the bed of the stream downstream of the bridge with a 0.6 m drop into a plunge pool. The ledges were undercut in a few places and there were some broken-off pieces in the plunge pool; some crawfish were collected from beneath these ledges and in the pool. The flow was moderate but almost no motion was evident in the pools. There were “cow cakes” in the stream. At 1720 hrs the temperature of the water was 28°C.

Associates.—Crawfishes collected with *Orconectes (Hespericambarus) hartfieldi* at one or more sites were *Procambarus (Pennides) ouachitae* Penn, 1956, *Cambarus (Lacunicambarus) sp. ref. ludovicianus*, and an undescribed member of the genus *Or-*

conectes assignable to the subgenus *Gremicambarus*.

Relationships.—The closest relatives of *Orconectes* (*Hespericambarus*) *hartfieldi* are *O. (H.) hathawayi* Penn, 1952 and *O. (H.) perfectus* Walls, 1972. First form males of *O. (H.) hartfieldi* are easily separated by the presence of a subapical notch or shallow depression on the caudodistal margin of the central projection; the notch is suggested on the male, Form II, but it is not so clearly defined. The annulus ventralis of the female is the most sculptured of the subgenus, and the deep sulcus and long sinus differentiate it from its close relatives. Geographically, the position of *O. (H.) hartfieldi* in the Yazoo system is between the range of *O. (H.) perfectus* (Tombigbee system) and *O. (H.) hathawayi* (southcentral Louisiana).

Etymology.—We take pleasure in naming this crawfish in honor of Paul D. Hartfield, formerly Curator of Invertebrates at the Mississippi Museum of Natural Science, in recognition of his vigorous efforts to collect crawfishes from his state and thus contribute to our knowledge.

Acknowledgments

We express our thanks to the collectors indicated in the "range" comments above

for their efforts in securing specimens. Especially we note the constructive criticism of the manuscript by H. H. Hobbs, Jr.

Literature Cited

- Cooper, M. R., & H. H. Hobbs, Jr. 1980. New and little known crayfishes of the *virilis* section of the genus *Orconectes* (Decapoda: Cambaridae) from the southeastern United States.—Smithsonian Contributions to Zoology 320:iii + 44 pp.
- Fitzpatrick, J. F., Jr. 1987. The subgenera of the crawfish genus *Orconectes* (Decapoda: Cambaridae).—Proceedings of the Biological Society of Washington 100:44–74.
- Penn, George H., Jr. 1952. A new crawfish of the *Virilis* Section of the genus *Orconectes* (Decapoda, Astacidae).—Natural History Miscellanea 109:1–7.
- . 1956. A new crawfish of the genus *Procambarus* from Arkansas (Decapoda, Astacidae).—Lloydia 19:109–119.
- Walls, Jerry G. 1972. Three new crawfishes related to *Orconectes difficilis* (Faxon) (Decapoda, Astacidae).—Proceedings of the Biological Society of Washington 84:449–458.

(JFF) Department of Biological Sciences, LSCB 124, University of South Alabama, Mobile, Alabama 36688, U.S.A.; (RDS) Tulane University Museum of Natural History, Belle Chasse, Louisiana 70037, U.S.A.